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**Research Article**

# Study on Intestinal Parasitic Infections in Muslim community of Janakpurdham, Nepal

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**ABSTRACT**

**Background and Objectives:** Intestinal parasitic infection is an important public health problem in Nepal because of its high morbidity and mortality. The distribution and prevalence of the various intestinal parasites species depend on social, geographical, economical and inhabitant customs. Therefore, the present study was designed to determine the burden of intestinal parasitic infections and its relation with sanitary practices and socio-demographic characteristics in Muslim community of Janakpurdham, Nepal.

**Material and Methods:** A total of 161 stool samples were collected in dry, clean and screw capped plastic container and were preserved with 10% formalin. The stool samples were examined by direct microscopy and confirmed by concentration methods. Modified Ziehl Neelsen (ZN) staining was performed for the detection of coccidian parasites. P- value < 0.05 was considered as statistically significant.

**Results:** The incidence of intestinal parasitic infection was 63.35% (male = 57.84% vs. female = 42.15%) (p = 0.321). The positive cases of parasitic infection were found to be slightly higher in less than 10 years (35.29%) than others. Hookworm (10%) and *G. lamblia* (28%) infection was marginally higher than other helminthic and protozoan infection. The highest number of positive cases of parasitic infection was found in those who didn't wash their hands before meal, defecates stool haphazardly in open area, didn't wash their hands after toilet, didn't trim their nail, in larger family, with low income and in housewives which was found to be statistically significant (p = <0.05).

**Conclusion:** The health status was found poor among Nepalese Muslim people. Routine periodic screening of parasitic infection among people, changing behavior, public educations on improved personal and environmental hygiene are the fundamental principle in the control of infection.

**Key Words:** Socio-economic status, Intestinal parasitic infection, Helminthes, Protozoan, Muslim

## INRODUCTION

Intestinal parasitic infections are endemic in most tropical and subtropical countries, particularly in developing countries. About 70% of health problems are due to infectious diseases and diarrheal disease alone which is one of the major causes of morbidity and

mortality in Nepal [1, 2]. At least 5 million deaths occur per year in developing countries due to diarrhoeal disease [3]. According to WHO, in many countries malabsorption, diarrhoea, blood loss, impaired work capacity and reduced growth rate due to intestinal parasitic infections constitute important health and social problems [4].

Most common intestinal parasites reported in Nepal are *Ascaris lumbricoides*, *Hymenolepis nana*, Hookworm, *Trichuris trichiura, Giardia lamblia* and *Entamoeba histolytica. Ascaris lumbricoides, Trichuris trichiura* and Hookworms, collectively referred to as soil-transmitted helminths (STHs) which are the most common intestinal parasites [5,6]. Furthermore, other parasitic infections such as abdominal angiostrongyliasis, intestinal cyclosporiasis and strongylodiasis are local or regional public health concern. There are different predisposing factors that cause intestinal disorder which includes several factors comprising age related immune system dysfunction, achlorhydria, altered intestinal colonic motility and changes in faecal flora [7].

The Terai region of Nepal has its own share of multiple ethnic, linguistic, religious and cultural groups of people [8, 9]. The racial, religious, cultural and social systems are diversified according to the diversity of castes of living with respect to geography. Muslims constitute the most distinct and well-defined minority group in Nepal having a distinct identity in a predominantly Hindu-Buddhist set-up due to their adherence to Islam and their ethno-cultural affiliation too. Nepalese Muslims are increasing at the rate of 4.8% annually. The strength of the Muslims is giving the community a new feeling of group identity in the present set-up which acknowledges the multi-ethnic and multi-religious nature of Nepali society [8, 10].

Nepal is a small impoverished country where intestinal parasitosis is being highly prevalent and varies considerably [11]. The health status of the population is a reflection of the socio-economic development of the country. It is influenced by a variety factors like the level of income and living standards, housing, water supply, education, sanitation including work place environment, employment, consciousness, the coverage, accessibility and affordability of health care delivery services, social security and participation in the socio-political activities of the community, recreation and human rights [12].

Since the beginning of Muslim's settlement in Terai region of Nepal, the Muslim population is quite dispersed having a very low profile, and have quietly accepted their low caste rank in the social hierarchy in comparison to Hindu religion [10]**.** Due to insufficiency of research and lack of noticeable attention towards backward ethnic group increases the interest of researchers towards parasitic infection. No any authentic data on Muslim's health status has been found so far in previous few years. Therefore, the present study throws light on Muslim community of Janakpurdham located in Dhanusha district, Nepal notifying the burden of infections of the intestinal parasite and association of infection with sanitary practices and socio-demographic characteristics. The findings of this study may be fruitful for improvement of health status with their low socio-economic status for the reduction of parasitic infection mortality.

## MATERIAL AND METHODS

### Study Design

This cross-sectional descriptive study was conducted in 2015 among Muslim people of all age groups and random sampling technique was used. The laboratory investigations were carried out at Ram Janaki Hospital, Janakpurdham which is located in Dhanusha district of Nepal.

**Sample Collection and Transportation**

The stool samples were collected from the Muslim peoples. Each volunteer of Muslim community were given the brief description about the importance of the examination of stool to detect the parasite. They were advised not to contaminate the stool with water and urine. The containers were labeled with name, code number, date and time of collection. During the process of specimen collection from each person, a questionnaire accompanying the queries about their clinical history, hygienic practice and nutritional behaviour was filled. Labeled dry, clean disinfectant free wide mouthed plastic container was distributed and asked them to bring about 10 gms stool sample next morning. The collected stool samples were immediately fixed with 10% formalin solution mixing with equal part of formalin and stool. The formalin fixed samples were brought to laboratory and were processed.

**Sample Processing**

The collected samples were examined by macroscopic and microscopic examination.

**Macroscopic Examination**

The color, consistency, presence of blood and mucus, presence of adult worms and segments and other abnormalities were observed.

**Microscopic Examination**

Microscopic examination was done for the detection and identification of protozoal cysts, oocysts, trophozoites and helminthic eggs or larva by wet preparation (normal saline and iodine preparation), concentration (formal-ether sedimentation technique or floatation technique by using Sheather's sugar solution) and modified Ziehl Neelsen (ZN) method employed for all the stool specimens.

**Ethical Consideration**

Informed verbal consent was obtained from the participants prior to the study before proceeding the questionnaire and specimen collection. Work approval was taken from Ram Janaki Technical Academy and Ram Janaki Hospital, Janakpurdham, Nepal.

**Inclusion and Exclusion Criteria**

Those participants who came with stool samples without contamination with water were included whereas the stool samples contaminated with water and questionnaire not filled in appropriate manner were excluded from the study.

**Statistical Analysis**

The obtained data was analysed using SPSS 20 version and Microsoft Excel 2007. The relation of parasitic infection with sanitary practices, socio-economic conditions and socio-demographic factors were assessed by using the Chi-square test. The p–values $< 0.05$ were considered as statistically significant.

**RESULTS**

**Pattern of age and gender-wise distribution of parasitic infection**

A total of 161 Muslim people were studied for the parasitic infection. Of total, 98 were male

and 63 were female. Most of the male respondents (57.84%) suffered from the parasitic infection than female (42.15%) which was found statistically insignificant (p = 0.321). Similarly, among total respondents, 62 were less than 10 years, 39 were between 11 to 30 years, 54 were between 31 to 60 years and 6 were greater than 60 years. The positive cases of parasitic infection were slightly higher in less than 10 years (35.29%) than 31 to 60 years (33.33%) followed by 11 to 30 years (28.43%). The result was seen statistically different (p = 0.137) as shown in table 1.

**Types of Parasites detected from Stool sample**

Altogether 161 stool samples were examined. 117 parasites were detected from total stool sample out of which 41 were helminthes and 76 were protozoans. Hookworm 12 (10%), *H. nana* 3 (3%), *A. lumbricoides* 9 (8%), *T. trichuria* 7 (6%), *S. stercolaris* 6 (5%), *Taenia spp*, 4 (3%) were detected as helminthes while protozoans were *G. lamblia* 33 (28%), *E. histolytica* 28 (24%), *B. hominis* 6 (5%), *C. cayetanensis* 9 (8%). The results are shown in figure 1.

**Table1: Age and Genderwise occurrence of parasitic infection**

| Gender | Total | Positive (%) | p-value |
|---|---|---|---|
| Male | 98 | 59 (57.84) | **0.321** |
| Female | 63 | 43 (42.15) | |
| **Total** | **161** | **102** | |
| **Age group (yrs)** | | | |
| <10 | 62 | 36 (35.29) | **0.137** |
| 11-30 | 39 | 29 (28.43) | |
| 31-60 | 54 | 34 (33.33) | |
| >60 | 6 | 3 (2.94) | |
| **Total** | **161** | **102** | |

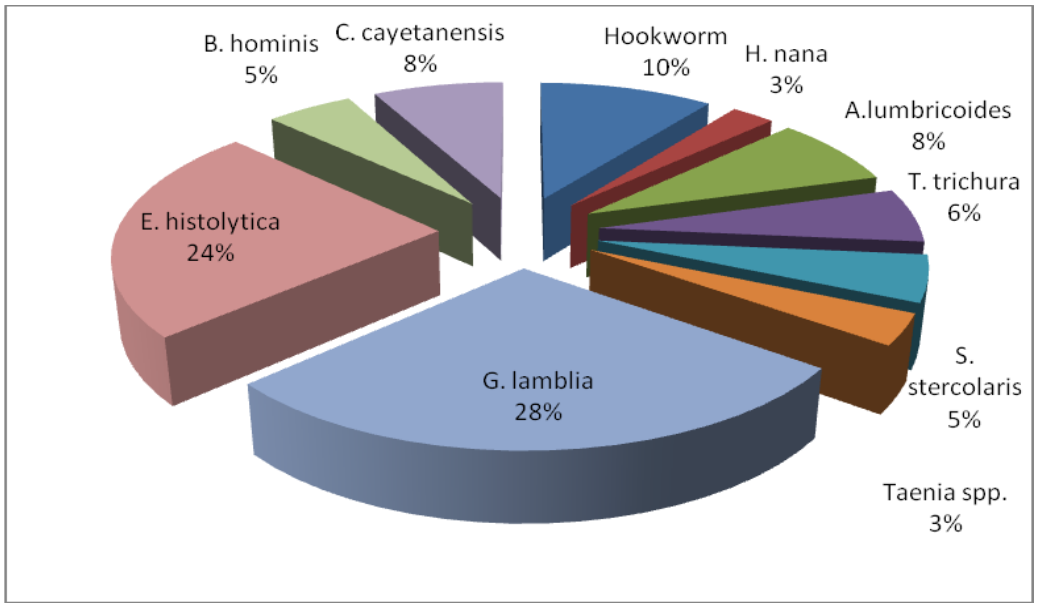


**Figure 1: Frequency of parasites detected from stool sample**

### Distribution of types of parasitic infections

Figure 2 shows that most of the respondents were infected with single parasites, of which 67 were protozoans and 28 were helminthes. The least number of respondents were infected with multiparasites. Of which 11 were protozoans and 8 were helminthes and 4 were mixed (i.e. protozoans and helminthes).

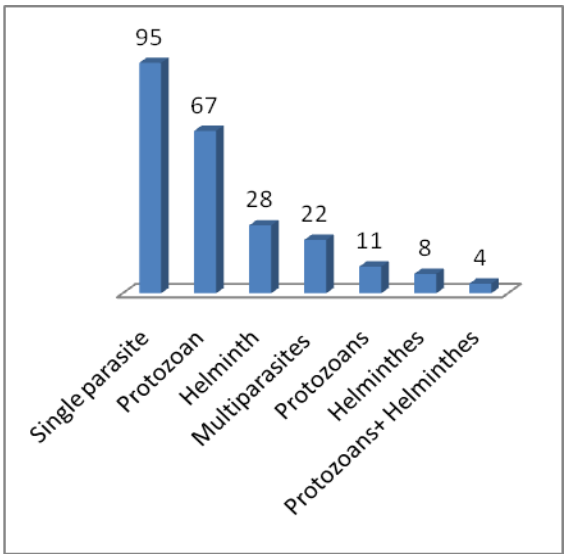


**Figure 2: Pattern of types of infections among study population**

### Distribution of Parasitic Infection in relation to Sanitation

From total study population, 63 washed their hands before meal, 79 defecated stools in open area and 82 used modern toilet, 74 washed their hands after toilet and 64 trimmed their nails. The highest number of positive cases of parasitic infection was found in those respondents who hadn't washed their hands before meal 65(63.72%), defecated stool haphazardly in open area 61(59.80%), hadn't washed their hands after toilet 63 (61.76%) and did not trim their nails 67(65.67%). The results are found to be statistically significant (p = 0.001) and are as shown in table 2.

**Table 2: Relation of positive cases of infection to sanitation**

| Washing hands before meal | Total | Positive cases (%) | p-value |
|---|---|---|---|
| Yes | 63 | 37 (36.27) | **0.001** |
| No | 98 | 65 (63.72) | |
| **Total** | **161** | **102** | |
| **Stool defecation** | | | |
| Open area | 79 | 61 (59.80) | **0.001** |
| Modern toilet | 82 | 41 (40.19) | |
| **Total** | **161** | **102** | |
| **Washing hands after toilet** | | | |
| Yes | 74 | 39 (38.23) | **0.001** |
| No | 87 | 63 (61.76) | |
| **Total** | **161** | **102** | |
| **Nail trimming** | | | |
| Yes | 64 | 35 (34.31) | **0.001** |
| No | 97 | 67 (65.68) | |
| **Total** | **161** | **102** | |

### Incidence of Parasitic infection in relation to Socio- economic condition

Table 3 shows most of the respondents had annual income greater than NRs 15, 000. The incidence of positive cases of parasitic infection was higher in respondents who had less than NRs 15, 000 annual income of 59.80% and was statistically significant (p = 0.0001).

**Table 3: Pattern of positive cases of infection in relation to socioeconomic condition**

| Annual income (NRs) | Total | Positive cases | p-value |
|---|---|---|---|
| <15,000 | 73 | 61 (59.80) | **0.0001** |
| >15,000 | 88 | 41 (40.19) | |
| **Total** | **161** | **102** | |

**Table 4: Relation of positive cases of infection to socio- demographic characteristics**

| Family size | Total | Positive cases | p-value |
|---|---|---|---|
| <6 | 17 | 15 (14.70) | **0.0001** |
| >6 | 91 | 87 (85.29) | |
| **Total** | **161** | **102** | |
| **Educational status** | | | |
| Illiterate | 98 | 72 (70.58) | **0.0001** |
| Literate | 63 | 30 (29.41) | |
| **Total** | **161** | **102** | |
| **Occupation** | | | |
| Students | 13 | 8 (7.84) | **0.0001** |
| Tailoring | 28 | 10 (9.80) | |
| Mason | 23 | 17 (16.66) | |
| Plumber | 15 | 11 (10.78) | |
| Carpenter | 12 | 5 (4.90) | |
| Farmer | 16 | 13 (12.74) | |
| Labor | 20 | 18 (17.64) | |
| Housewife | 27 | 19 (18.62) | |
| Job holder | 7 | 1 (1) | |
| **Total** | **161** | **102** | |

## Occurrence of Parasitic Infection in relation to Socio-demographic characteristics

Table 4 shows socio-demographic characteristics of Muslim community. Most of the respondents were from large family more than 6 members, were illiterate and occupation with tailoring followed by housewives. The highest number of positive cases of infection were seen in large family (85.29%), in illiterate (70.58%) and in housewives (18.62%) followed by labors (17.64%) which was found to be statistically significant (p = 0.0001).

## DISCUSSION

Lack of adequate hygiene, sanitation, illiteracy, overcrowding and other living condition of majority of Nepalese families leads to be the victim of parasitic infection which can cause significant morbidity and mortality in the population [5,13]. The geographical and socioeconomic conditions contribute problems in diagnosing the infection in developing countries. These countries located in the warm or hot and relatively humid areas that combined with poverty, malnutrition, high population density, unavailable filtered water and low health status which provides optimum growth and transmission of parasites [11].

The present study revealed high prevalence (63.35%) of intestinal parasitosis among Muslim community. It could be due to over dispersion of parasites, poor sanitary condition, low socio-economic status of people and deprived of health education. This study depicted that most of the male (57.84%) had suffered from the parasitic infection than female (42.15%) which was found statistically insignificant (p = 0.321).

This possibility could be due to higher number of male respondents involved in this study. A similar type of results was also obtained in the Islamic Republic of Iran by Sayyari et al 2005 [14].

The present study found that the positive cases of parasitic infection was slightly higher in less than 10 years (35.29%) than 31 to 60 years (33.33%) followed by 11 to 30 years (28.43%) and was statistically different (p = 0.137). The parasitic infection rate was higher in children than adults. A similar type of result was obtained from the study conducted at National College, Kathmandu, Nepal by Yadav and Prakash in 2016 [5]. This attribution may be due to carelessness towards their personal hygiene and childish activity like eating, playing outside and walking with bare foot which causes larvae to penetrate in skin.

In this study, 117 parasites were detected from stool samples where 41 were helminthes and 76 were protozoans. The helminthes were detected as Hookworm (10%), *H. nana* (3%), *A. lumbricoides* (8%), *T. trichiura* (6%), *S. stercolaris* (5%), *Taenia spp*, (3%) while protozoans were *G. lamblia* (28%), *E. histolytica* (24%), *B. hominis* (5%), *C. cayetanensis* (8%).

The results of the present study showed the prevalence of Hookworm infection was marginally higher than other helminthes infection which may due to the people walking bare foot which cause skin penetration by Hookworm larvae. It is one of the most common soil transmitted helminthes in Nepal [15]. Ingestion of the filariform larvae present in the soil but it occurs rarely, breast milk from mother to infants and transplacental transmission is rare. But, the probable reason for the higher prevalence of hookworm infection may be due to defecation by people haphazardly in the open ground. Similarly, *A. lumbricoides* was found second most predominant parasite among total helminthes detected in this study. This might be because of *Ascaris* eggs can survive in environment for longer period due to presence of chitin protein layer in their shell [16] and are responsible for infection.

Soil transmitted helminthes infections are endemic in the communities where poor environmental sanitation and poor personal hygiene play an important role in transmission of STH infections. STH (*A. lumbricoides, T. Trichiura* and Hookworms) cause morbidity in humans in different ways by affecting nutritional equilibrium, inducing intestinal bleeding, inducing malabsorption of micronutrients, reducing growth, reducing food intake, causing complications such as obstruction rectal prolapsed, abscess and affecting congenital development [6].

This study also depicted attention to lower prevalence of *S. stercolaris, H. nana* and *Taenia spp*. *Strongyloides* is worldwide parasitic disease which is of great importance. Low prevalence observed in this study may be due to difficulty in identification of larva of *Strongyloides* [17]. *H. nana* is the most common tapeworm infecting man in Southern Nepal with 3.3% [18] which is similar to this study. The low prevalence of *H. nana* in this study may be due to rarely transmission occurred from the ingestion of food contaminated with fleas harbouring the cysticercoid larvae. The occurrence of *Taenia* may be due to risk factors associated with eating raw or insufficiently cooked pork, raw vegetables grown in field fertilized with human faeces contaminated with eggs of *T. solium*.

This study reported that *G. lamblia* was found to be the most common protozoan among the infected people. The highest prevalence of *Giardia* indicates that the poor sanitary and personal hygienic condition of the respondents. Furthermore, the cyst of *G. lamblia* is resistant to the normal level of chlorination, and therefore, it can be easily transmitted through drinking water. The common causes of acute or persisting diarrhea in children which interferes with intestinal absorption nutrients and growth rate of children.

This study also showed that *E. histolytica* was found to be slightly lower than that of *G. lamblia.* Infection with *E. histolytica* is common in inhabitants of developing countries and it predominantly affects people with poor socio-economic conditions, non-hygienic practices and malnutrition [19]. The lower prevalence might be due to the study of single stool specimen for detecting cysts and trophozoite of the parasite. In the present study, *B. homonis* was also found with low prevalence rate (5%). This may be due to the autolysis of *B. hominis* cysts during the time tumbled between sample collection and examination [20]. The percentage of monoparasitism were higher than multiparasitism in this study. Similar finding was also reported by Shrestha et al 2012 [21].

The present study also revealed that the highest number of positive cases of parasitic infection was found in those respondents who hadn't wash their hands before meal (36.27%), defecated stool haphazardly in open area (59.80%), who hadn't washed their hands after toilet (61.76%) and who didn't trim their nail (65.67%) which was statistically significant (p = 0.001). Lack of toilet affects the environmental sanitation on prevalence of soil-transmitted helminthes. Due to insufficiency of proper toilet, indiscriminate defecation around the houses, fields, roads, and playgrounds increases the chance of parasitic infection. It may be due to pit type of toilet which do not have proper flushing system and results with consequences of maximum distribution of parasites. Most of people washed their hand with ash and mud, which is the main source of soil-transmitted helminthes that again enable people to be infected with parasites. Habit of suckling of fingers, unhygienic playing fields and eating with unwashed hands are the major output risk factors in causing intestinal parasitic infection.

In this study, the incidence of positive cases of parasitic infection was found higher in those respondents who had less than 15,000 annual income of 59.80% and was statistically significant (p = 0.0001). Muslims involve the majority of children in reproduction due to misconception developed traditionally, reproducing more children is very fortunate that "Children are the boon of Allahas" and avoids family planning. With low income and increasing family members, overcrowding leads to aloofness to safe drinking water, unhygienic personal habits and superstitions due to lack of knowledge and awareness.

The present study also found that the highest number of positive cases of infection was seen in the largest family, illiterate and housewives followed by labors which was statistically significant (p = 0.0001). This may be due to the poor sanitation, use of uncleaned utensils, involvement in agricultural activities, active participation in household activities and lack of proper care and negligence. The higher rate of infection in labor may be due to haphazard open defecation which leads to land contaminated

faecal matter, lack of public awareness and use of contaminated drinking water.

## CONCLUSION

The parasitic infections are closely related with the hygienic and sanitary condition. The present study highlights that health status of Nepalese Muslims is still very pitiable. The incidence of parasitic infection in Muslim respondents was found to be high. Hookworm and *Giardia lamblia* was the commonest helminthes and protozoan. Most of the children and adults were infected with parasites. The incidence rate of parasitic infection was higher in the people not washing hands before meal and after toilet, who defecated stool in open area, who did not trim their nail, illiterate, housewives and peoples with low income.

Public educations on improved personal and environmental hygiene are the fundamental principle in the control of intestinal parasitic infection. Routine periodic screening of parasitic infection among people will provide early detection, prompt therapy and interruption of transmission of the pathogens. Changing behavior like wearing slippers, avoiding raw vegetables and meat also helps in declining the parasitic ratio. Development of proper sewage system and use of pipe borne water are the main elements in controlling the parasitic infection.

## LIMITATIONS

Although this study provides a lot of information regarding the state of intestinal parasitic infection among Muslim people but there are also some limitations as:

- Due to time factor and other obstacles, the study had to be confined over limited sample size.
- The findings cannot be extrapolated to the entire Muslim community of Nepal.

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## AUTHOR'S CONTRIBUTION

**KY-** Designed the core concept of study, drafting of manuscript and statistical analysis; **SP-** Reviewed literatures, critically reviewed the scripted manuscript and decisive revision of final manuscript.

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